

NOVEL 2-QUADRANT PSM HIGH VOLTAGE POWER SUPPLY FOR HIGH POWER GYROTRON AND KLYSTRON TEST FACILITY

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THOMSON Broadcast & Multimedia AG designed and built the complete power supply system for the new test facility KGP5 for high power gyrotrons and klystrons of THALES Electron Devices (TED) in Vélizy, France. The system is designed for highest flexibility in order to meet the requirements for testing different tube types with different power levels. It consists of a main power supply (HVPS) and an anode-body modulator power supply (ABM). The HVPS is rated for 0 to 160kV and 3.2MW continuous power and can be operated in either cw or pulsed mode with an adjustable duty cycle and pulse repetition rate in the range of 0.1Hz to 10kHz. The minimum rise time for the HVPS is 5 μ s. The ABM is rated for 0 to 100kV and 150mA, either in cw or pulsed operation with a maximum modulation frequency of 5kHz. Both power supplies have been realized with an enhanced PSM technology providing new useful features.

For the HVPS, Thomson implemented the advancement of 2-quadrant PSM power modules (patent pending). This allows achieving very low arc energies in case of a short circuit at the output. The energy, stored in the output filter network and cable, can be charged back into the power modules in case of a short circuit. With this improvement the very low figure of < 2J of deposited energy in the load can be achieved (100V arc voltage assumed). Furthermore, a possibility to adjust the deposited energy into the load between 2 – 20J has been implemented in order to do the conditioning of the tubes where necessary.

The ABM is able to handle capacitive loads as required by the electron tubes. Capacitive loads are causing negative currents in the power supply. To be able to handle these currents, the ABM has been designed in a push – pull technology which allows negative currents. In addition, to suppress system perturbation, the power supply has been equipped with power factor correction devices.

The paper will give an overview of the system design and it will show field experiences as well as test results which have been taken during on site testing of the power supplies. It will also highlight in detail the advantages of the different enhancements on both PSM topologies.